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Safety in a chemistry lab

A SHORT INTRODUCTION

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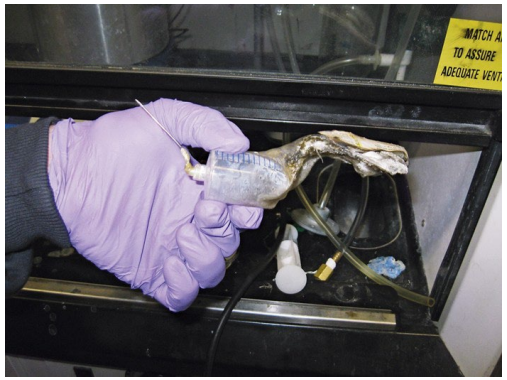
Why we need safety?

Why we need safety?



- The University of California (UCLA) Lab Fire (2008):
  - What happened:
    - A research assistant at UCLA was working (alone) with tert-butyllithium (ignites spontaneously in air).
    - She was transferring a total of 160 mL of t-BuLi solution using a 60 mL plastic syringe. The plunger came out of the syringe barrel and the t-BuLi was exposed to the atmosphere.
    - The t-BuLi ignited, along with her clothes. She wore nitrile gloves, no lab coat, and possibly no eye protection.
  - Impact: The blast resulted in severe burns and injuries to the assistant, who died. The lab, which wasn't following the regulations was closed for 3 years.

Why we need safety?

- Texas Tech University Lab Explosion (2010):
  - What happened:
    - A student synthesized 10 g of nickel-hydrazine-perchlorate (explosive compound). The professor told to not prepare more than 100 mg.
    - When he was grinding the compound, it exploded.
    - He was working outside of a hood and without a blast shield and personal protective wear.
  - Impact: The lab bench was damaged, and the student lost three of his fingers, his hands and face were burned, and one of his eyes was injured.

Why we need safety?

- Lethal intoxication at Dartmouth College (1997):
  - What happened:
    - Prof. Karen Wetterhahn used dimethylmercury for ^{199}Hg-NMR-spectroscopy.
    - After addition of a small amount of dimethylmercury (highly toxic liquid) into the NMR-tube several droplets splashed onto her left hand, protected with a latex glove.
    - She closed the NMR tube and removed the latex gloves.
    - After 5 month she got unbalancing and speech disorder. The medical doctor found extremely high concentrations of mercury in her blood.
  - Impact: Even intensive medical care could not prevent her death because of destruction of her central nervous system.

The permeation time of this chemical through latex safety gloves is in the range of several seconds.

Some important definitions

- **Safety:** is a situation resulting from the real absence of any hazard.
- **Hazard:** is a situation that has the potential to cause harm to human, environment and property.
- **Risk:** is a combination of the likelihood (probability) of an unwanted incident occurring and the severity of the consequences if it occurs and the frequency of exposure to the hazard.

Hazards in an organic chemistry lab

- Hazards arising from chemical substances and reactions:
  1. Explosive properties 
     - ❑ Explosives
     - ❑ Explosions caused by flammable gases and flammable solvents 
     - ❑ Physical explosions (explosive boiling)
     - ❑ Thermal explosion / thermal runaway reaction
  2. Oxidizing properties 
  3. Intoxication, sensitization, CMR (carcinogenic, mutagenic, reproduction-toxic) 
  4. Corrosive properties 
  5. Flammable, pyrophoric properties 
  6. Biohazard
     - ❑ Pathogenic microorganism 
  7. Nanomaterials
     - ❑ Particle diameter: 1 – 100 nm
     - ❑ Nanotubes, nanofibers, nanoplates

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Hazards in an organic chemistry lab

- Physical hazards:
  1. Compressed gases (Ar, N_2)
  2. Nonflammable cryogens (liquid N_2)
  3. High-pressure reactions (autoclave)
  4. Vacuum work (rotavapor, Schlenk line)
  5. Radiation (UV, visible, NIR) (photochemistry)
  6. Radio frequency and microwave hazards
  7. Radioactivity, LASER- and X-ray radiation
  8. Electrical hazards
  9. Magnetic fields (NMR-spectrometer)
  10. Sharp edges, needles (syringes, broken glassware)
  11. Slips, trips, and falls
  12. Ergonomic hazards in the laboratory



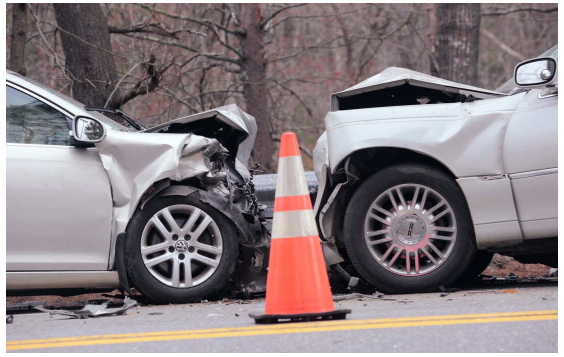





Human errors causing accidents

- About 85% of the accidents are caused by human errors, only a minority by technical defects!

1. Ignorance about dangerous properties of chemical substances and reactions.
2. Overestimation of one's own capabilities ("nothing happens to me").
3. Lost of initial respect for hazards because of long-term experience.



The risk term

- Risk = Severity x Probability

- The risk for a chemical incident is influenced by the “severity” and the “probability”.
- It can be mitigated by application of safety measures to an acceptable level, but not eliminated completely.
- “Zero risk” means the experiment will not be performed.

The risk term

- Risk = Severity x Probability

- Severity
  - ❖ “Potential of destruction”
  - ❖ Depends on dangerous properties and the amount of the substances
  - ❖ Decomposition energy (high or low)
  - ❖ Explosion or “only” self-heating
  - ❖ Toxicity (harmful, toxic or highly toxic)
  - ❖ Pure compound or diluted solution
  - ❖ Working scale

The risk term

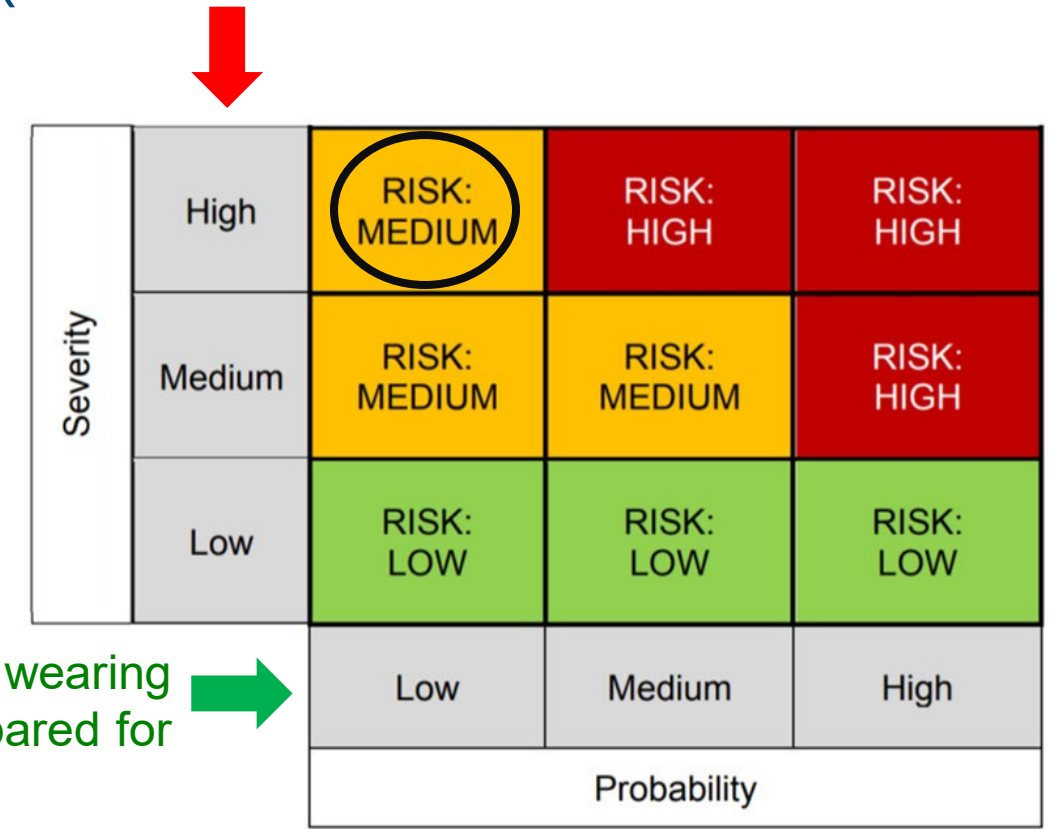
- Risk = Severity x Probability

- Probability
  - Likelihood
  - Depends on handling of the substances and the safety measures
  - “Distance” between T_{work} from T_{decomp}
  - Cleanliness and tidiness during the work
  - Personal safety equipment
  - Sufficient and proper planning of the experiments
  - Working in fume hood
  - Pyrophoric or “only” flammable

The risk term

- The risk matrix

Handling of a highly toxic compound



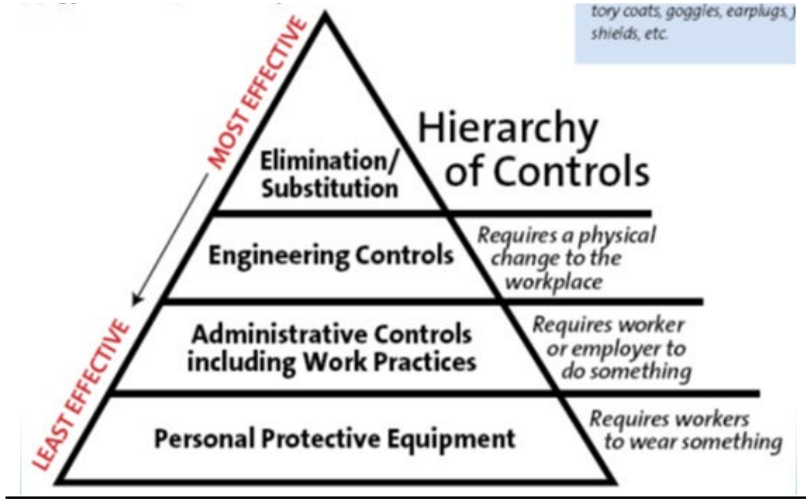
Working in the fume hood, wearing adequate safety gloves, be prepared for emergencies…

The risk term

- The RAMP protocol

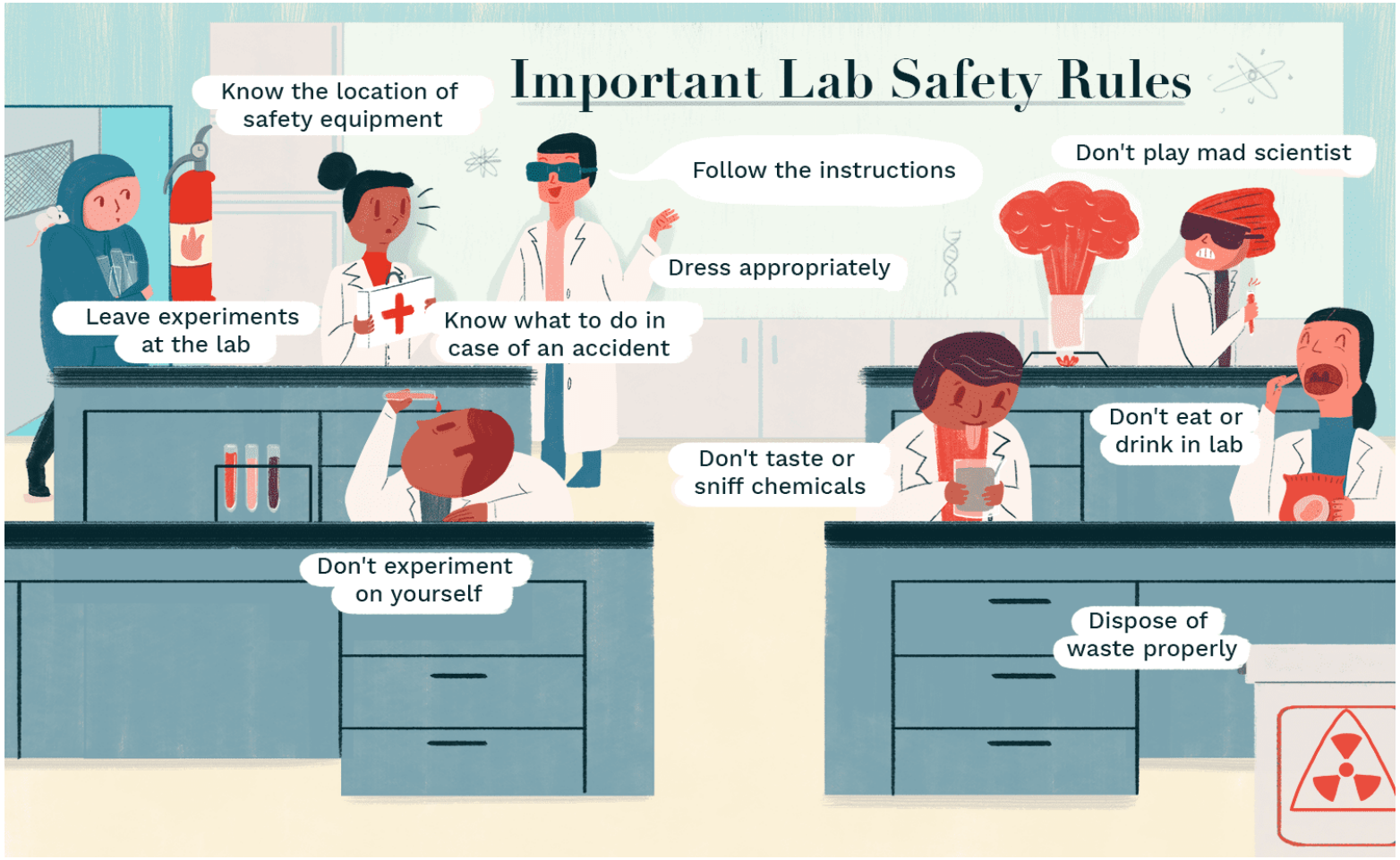
A simple protocol (called “RAMP”) for working safely in the laboratory is:

- Recognize hazards.
- Assess the risks of hazards.
- Minimize the risks of hazards.
- Prepare for emergencies.

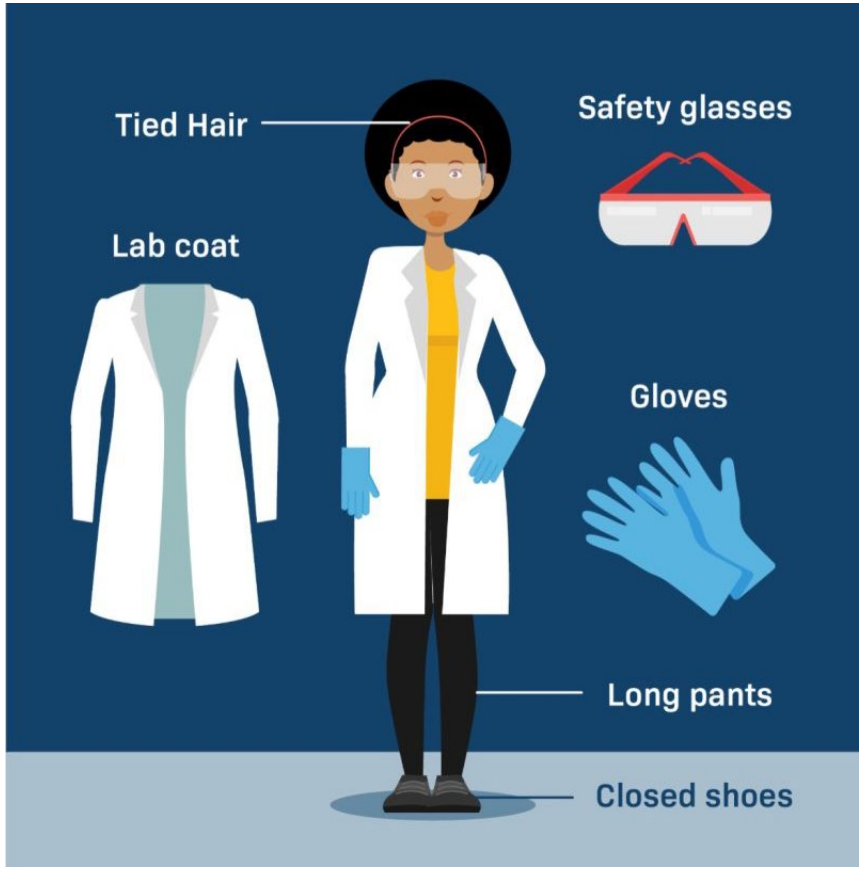


If you following this RAMP protocol in your laboratory and for all of your experiments, the likelihood of injury or illness becomes very low.

Basics rules



Personal Protective Equipment (PPE)



Do not wear headphones in the lab

Practice Good Housekeeping and Personal Hygiene

- Remove PPE before leaving the lab.
- Remove gloves before handling common items like phones, instruments, doorknobs, etc.
- Keep all working areas clean.
- Do not block emergency showers, eye washes, exits or hallways.

Practice Good Housekeeping and Personal Hygiene

•Avoid direct contact with any chemical.

•Never smell, inhale or taste laboratory chemicals.

•Always wash hands and arms with soap and water after removing gloves and before leaving the work area.

•Never eat or drink in the laboratory.

•Do not pick up broken glass with your hands.

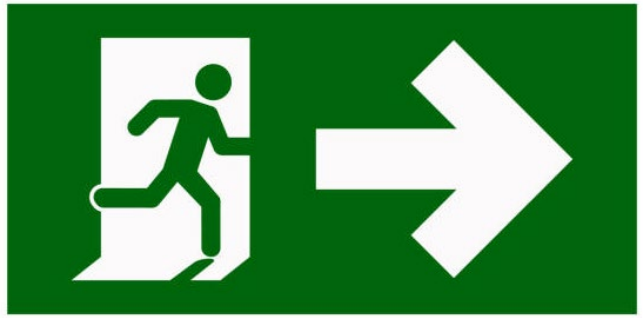
Transport Chemicals Safely

- Use secondary containers such as acid buckets or plastic totes.
- Secure containers on carts.
- Wear appropriate PPE.
- Use freight elevators or limit access in passenger elevators.
  - ❖ Do not go in the elevator with gas bottles or liquid nitrogen.
- Use a hand truck with a safety chain when moving compressed gas cylinders.

Emergency procedure

- Know the location of all the exits in the laboratory and building.

- Know the location of and know how to operate the following:
  - ❖ Fire extinguishers
  - ❖ Alarm systems with pull stations
  - ❖ Fire blankets
  - ❖ Eye washes
  - ❖ Safety showers
  - ❖ First-aid kits



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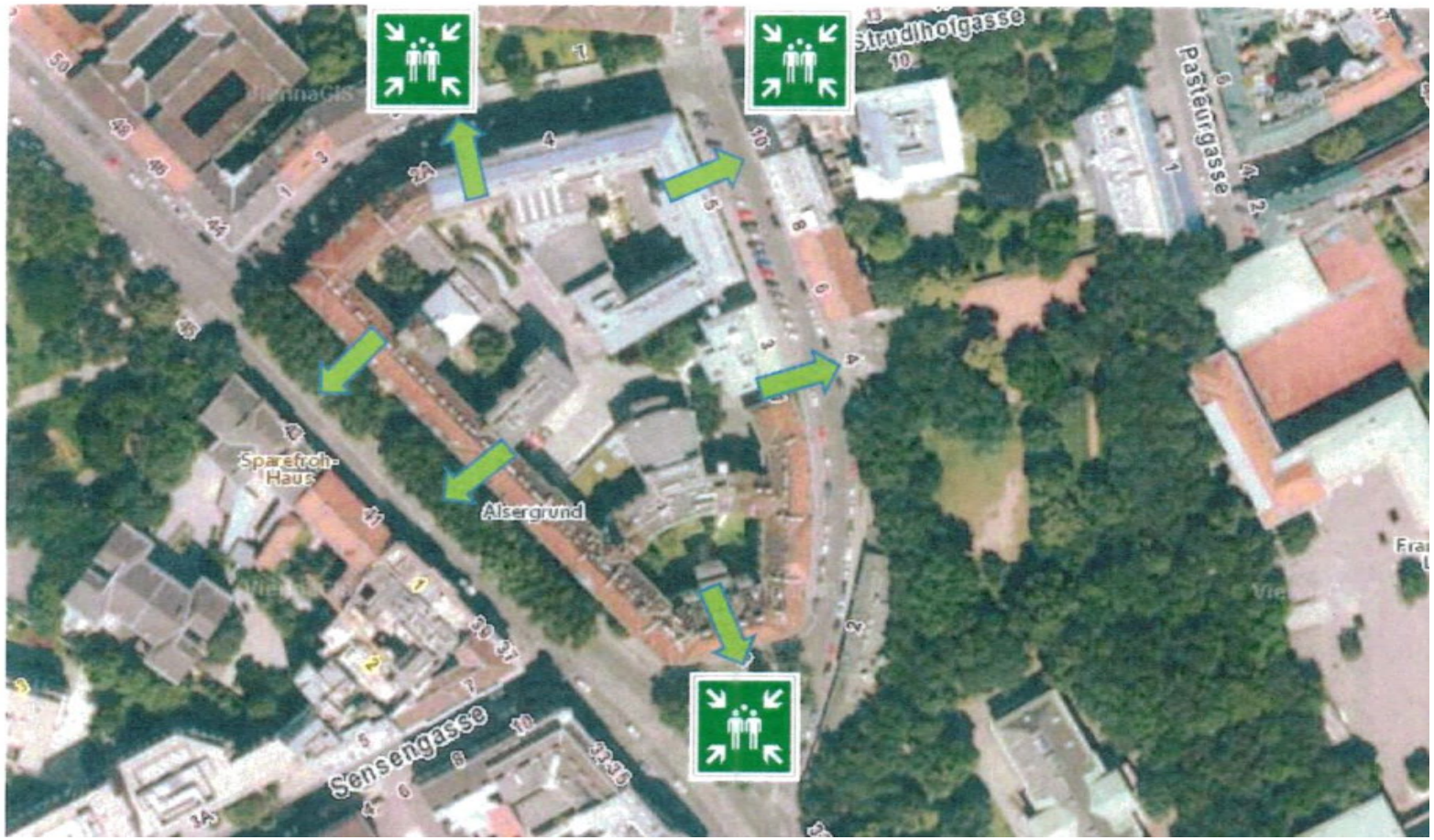
Emergency procedure



Emergency procedure

- Trainings offered by the University:
  - ❖ First-aid training
  - ❖ Chemistry safety training
  - ❖ Fire extinguisher training

https://urise.univie.ac.at/course/index.php?categoryid=6

Maintenance of Chemicals

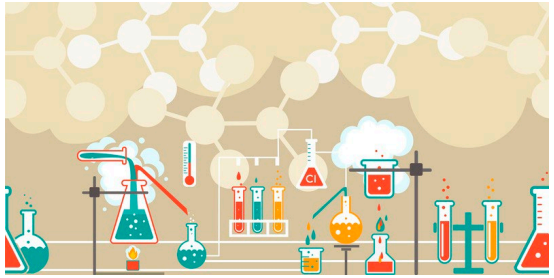
- Perform regular inventory inspections of chemicals.
- Update the chemical inventory at least annually (Open inventory).
- Do not store food and drink with any chemicals.
- If possible, keep all chemicals in their original containers.

Maintenance of Chemicals

- Make sure all chemicals are properly labeled.
- Do not store chemicals on the lab bench, on the floor, or in the fumehoods. Ensure chemicals not in use are stored in the proper cupboards or cabinets.
- Know the storage, handling, and disposal requirements for each chemical used.
- Dispose chemicals properly.

Preparing Laboratory Activities

- Before each activity (reactions, measurements…) in the laboratory, think about the potential risk factors.
- Understand all the potential hazards of the materials, the process, and the equipment involved.



- Inspect all equipment/apparatus in the laboratory before use.
- If you are supervising someone, discuss all safety concerns and potential hazards before starting the work.

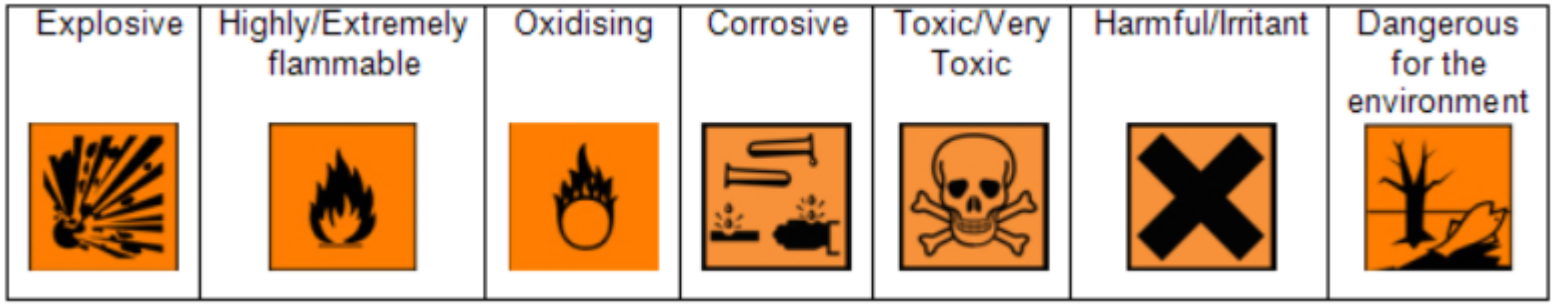
Ensuring Appropriate Laboratory Conduct

- Be a model for good safety conduct for others to follow.
- Make sure others are wearing the appropriate PPE.
- Always enforce all safety rules and procedures.

- Never allow people work alone in the laboratory (need to inform somebody).
- Never allow unauthorized visitors to enter the laboratory.
- Never allow people to take chemicals out of the laboratory (do not store them in the office).
- Never permit food or drink in the laboratory (not use EtOH for cocktails).

The Pictograms

- Old ones:



The Pictograms

- New ones

The Pictograms

- New ones:

- Flame:
  - Flammables
  - Pyrophoric
  - Self-Heating
  - Emits Flammable Gas
  - Self-Reactive
  - Organic Peroxides
  - Desensitized Explosives

The Pictograms

- New ones:

- Gas Cylinder:
  - Gases Under Pressure
    - Compressed gases
    - Liquefied gases
    - Refrigerated liquefied gases
    - Dissolved gases

The Pictograms

- New ones:

- Skull and Crossbones:
  - ❖ Highly toxic substances, which can cause severe health effects or even death upon exposure.
  - ❖ Acutely toxic substances can have severe effects from a single exposure or exposures of short duration.

The Pictograms

- New ones:

- Exclamation Mark:
  - Irritation to the skin and eyes (Irritant)
  - Allergic skin reactions (Skin Sensitizer)
  - General harmful effects (Acute Toxicity)
  - Drowsiness or dizziness (Narcotic Effects)
  - Irritation to the respiratory tract (Respiratory Tract Irritant)
  - Harm to the ozone layer (Hazardous to Ozone Layer).

The Pictograms

- New ones:

- Exploding Bomb:
  - Explosive substances that may lead to explosions under specific conditions.
    - Shock
    - Friction
    - Fire
    - Other ignition sources
  - Also, self-reactive and organic peroxides

The Pictograms

- New ones:

- Flame Over Circle:
  - Assigned to oxidizing chemicals.
  - Oxidizers are substances that may not burn themselves but can cause or contribute to the combustion of other materials.
  - They can provide oxygen to support a fire.
  - Some oxidizers can react violently with combustible materials (risk of fire or explosion).

The Pictograms

- New ones:

- Environment Pictogram:
  - ❖ Chemicals that can cause hazard to the environment, particularly aquatic environments.
  - ❖ This can include substances:
    - ➢ Toxic to aquatic life.
    - ➢ Cause long-term damage to aquatic environments.
    - ➢ Have other detrimental environmental effects.
  - ❖ This symbol serves to promote environmentally responsible handling and disposal of these substances.

The Pictograms

- New ones:

- Corrosion:
  - ❖ Warns of chemicals that can cause significant damage to living tissue or material they encounter.
  - ❖ Corrosive substances can:
    - ➢ Cause severe skin burns and eye damage upon contact.
    - ➢ Damage or even destroy metal surfaces.

The Pictograms

- New ones:

- Health Hazard:
  - ❖ Denotes hazards that could lead to significant health issues:
    - ➢ Cancer (Carcinogen)
    - ➢ Genetic defects (Mutagenicity)
    - ➢ Harm to reproductive health (Reproductive Toxicity)
    - ➢ Hypersensitivity of the airways (Respiratory Sensitizer)
    - ➢ Damage to specific organs (Target Organ Toxicity)
    - ➢ Harm from inhalation of certain substances (Aspiration Toxicity).

Safety Data Sheets (SDS)

What is a SDS?: a document that lists information relating hazards of working with a substance

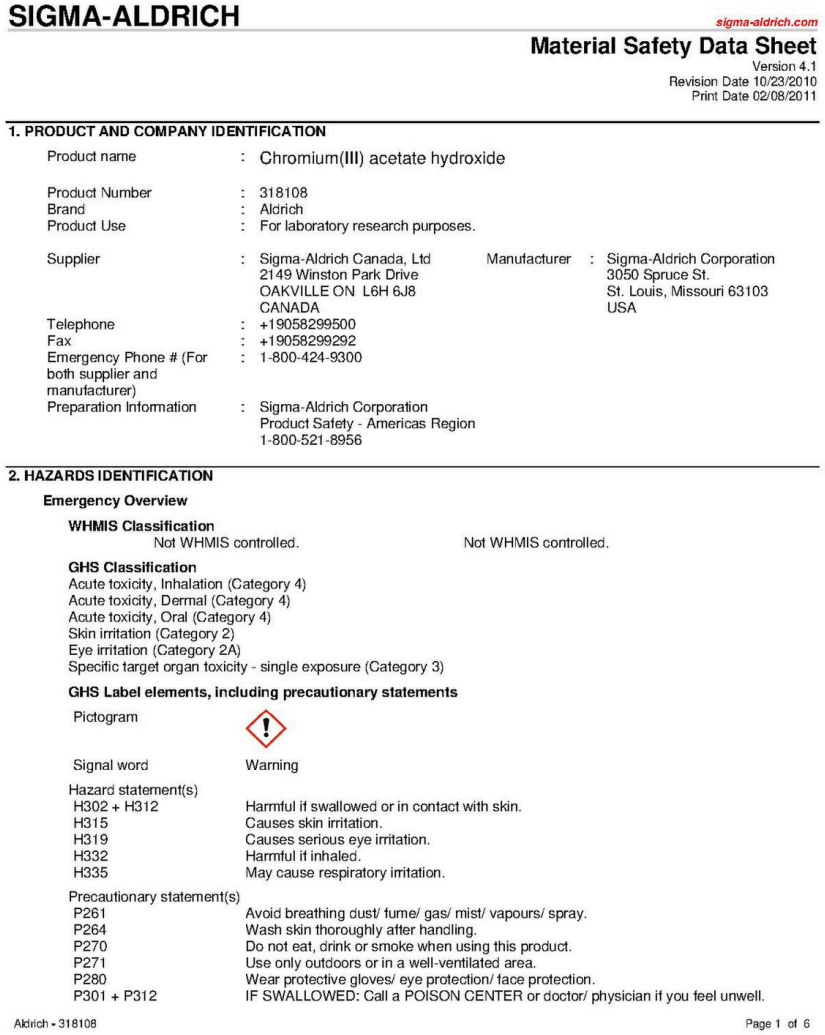
Which information contains?

- They follow the Globally Harmonized System of Classification and Labelling of Chemicals
- 16 sections

Safety Data Sheets (SDS)

Which information contains?

- Sections:
  - Section 1: Identification of the substance and company
  - Section 2: Hazards identification
  - Section 3: Composition
  - Section 4: First aid measures
  - Section 5: Firefighting measures
  - Section 6: Accidental release measure
  - Section 7: Handling and storage
  - Section 8: Exposure controls/personal protection
  - Section 9: Physical and chemical properties
  - Section 10: Stability and reactivity
  - Section 11: Toxicological information
  - Section 12: Ecological information
  - Section 13: Disposal considerations
  - Section 14: Transport information
  - Section 15: Regulatory information
  - Section 16: Other information



SIGMA-ALDRICH sigma-aldrich.com

Material Safety Data Sheet

Version 4.1
Revision Date 10/23/2010
Print Date 02/08/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Chromium(III) acetate hydroxide

Product Number : 318108
Brand : Aldrich
Product Use : For laboratory research purposes.

Supplier : Sigma-Aldrich Canada, Ltd
2149 Winston Park Drive
OAKVILLE ON L6H 6J8
CANADA

Manufacturer : Sigma-Aldrich Corporation
3050 Spruce St.
St. Louis, Missouri 63103
USA

Telephone : +19058299500
Fax : +19058299292
Emergency Phone # (For both supplier and manufacturer) : 1-800-424-9300
Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

WHMIS Classification
Not WHMIS controlled. Not WHMIS controlled.

GHS Classification
Acute toxicity, Inhalation (Category 4)
Acute toxicity, Dermal (Category 4)
Acute toxicity, Oral (Category 4)
Skin irritation (Category 2)
Eye irritation (Category 2A)
Specific target organ toxicity - single exposure (Category 3)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H302 + H312 Harmful if swallowed or in contact with skin.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H332 Harmful if inhaled.
H335 May cause respiratory irritation.

Precautionary statement(s)
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ eye protection/ face protection.
P301 + P312 IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.

Aldrich - 318108 Page 1 of 6

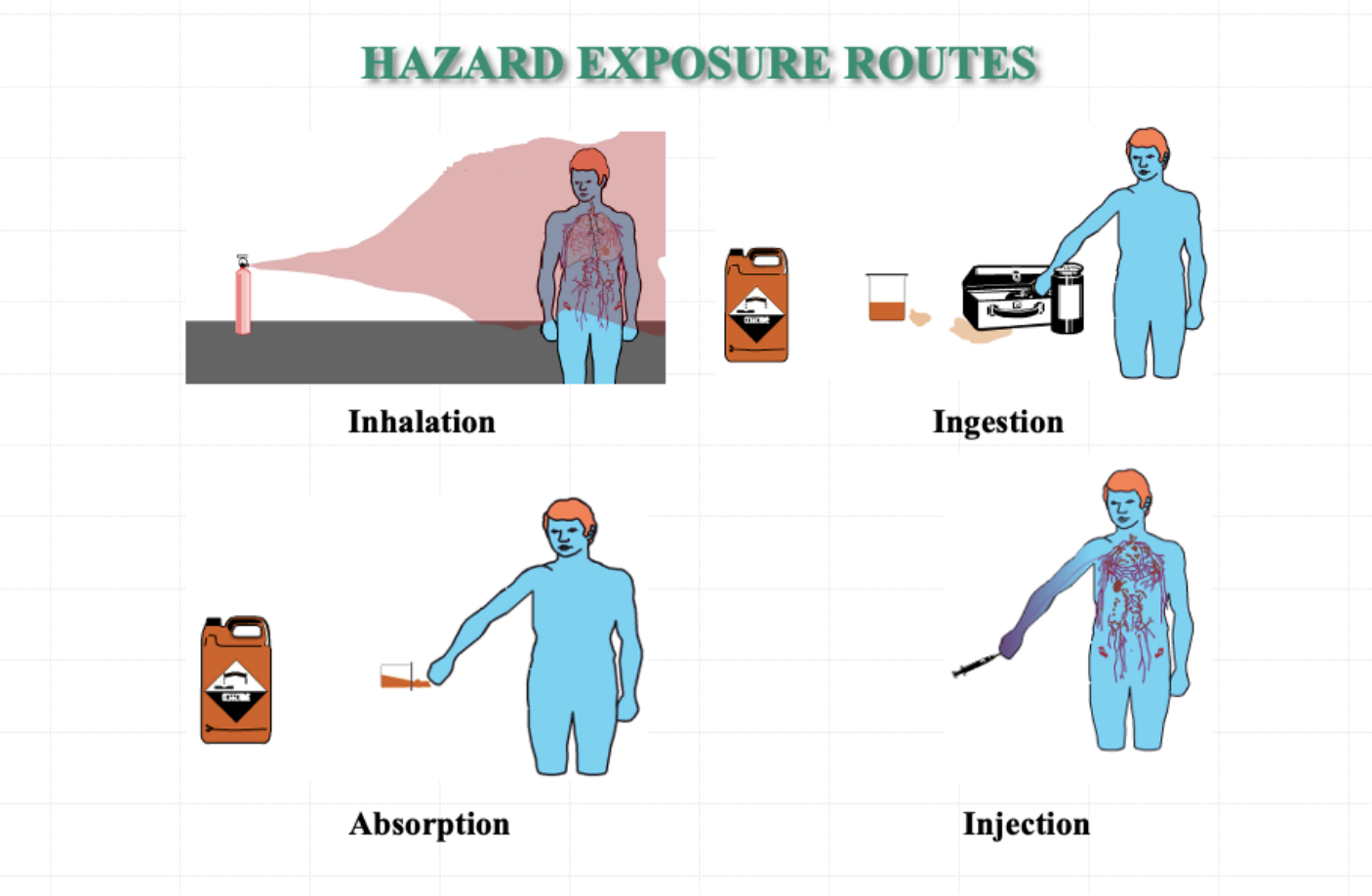
Safety Data Sheets (SDS)

What should I do?

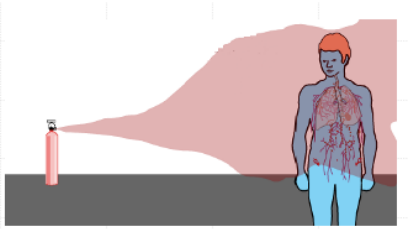
- Check the SDS of the chemicals when using for the first time
- Use an online chemical inventory system (open inventory)

Ways of exposure and what to do

- 4 main ways:
  - Inhalation
  - Ingestion
  - Injection
  - Absorption

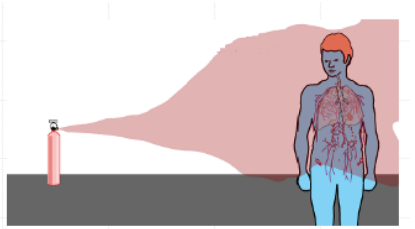


Ways of exposure and what to do



- 4 main ways:
  - ❖ Inhalation:
    - ➢ Occurs by absorption of chemicals via the respiratory tract (lungs).
    - ➢ Chemicals can be inhaled in the form of vapors, fumes, mists, aerosols and fine dust.
    - ➢ Symptoms:
      - o Eye, nose, and throat irritation
      - o Coughing
      - o Difficulty in breathing
      - o Headache
      - o Dizziness
      - o Confusion
      - o Collapse

Ways of exposure and what to do



- 4 main ways:
  - ❖ Inhalation:
    - ➢ What to do?
      - o If any of the symptoms are felt, leave the area immediately and get fresh air.
      - o Seek medical attention if symptoms persist and complete and accident report.
    - ➢ How to prevent?
      - o Working in a fume hood
      - o Use of dust masks and respirators when a fume hood is not available
      - o Avoiding bench top use of hazardous chemicals
      - o Cleaning fast chemical spills

Ways of exposure and what to do

- The accident report:

www.bvaeb.at

bvaeb
Versicherungsanstalt
öffentlich Bediensteter, Eisenbahnen und Bergbau

UNFALLMELDUNG

Meldepflicht besteht bei Tod oder mehr als drei Tagen Krankenstand.
Die **Meldefrist beträgt fünf Tage** (§ 129 B-KUVG i.V.m. § 363 ASVG). Über Aufforderung durch die Unfallversicherung ist jedenfalls eine Unfallmeldung vorzulegen (§16 B-KUVG).

Angaben zur Person	
Versicherungsnummer	
Name	
Wohnadresse	
Telefonnummer	
Familienstand	
Kinder unter 18 Jahren (ja/nein)	
Art des Dienstverhältnis (Beamter, Vertragsbediensteter, Lehrling, etc.)	
Zuständiger KV Träger	

Arbeits- bzw. Dienststelle	
Bezeichnung	
Adresse	

Firmenname bzw. Bezeichnung der personalführenden Stelle	
Bezeichnung	
Adresse	

Angaben zum Unfall	
Wochentag, Datum und Uhrzeit	
Arbeits-/Dienstzeit (vorgesehener Beginn und Ende)	
Gleitzeit (Zeitrahmen und Kernzeit)	
Üblicher Aufgabenbereich / Funktion	
Berufsbezeichnung	
Tätigkeit zum Unfallzeitpunkt	
Dienstliche Aufgabe (ja / nein)	
Lag ein Reiseauftrag vor (ja / nein)	

Unfallmeldung/01.01.2020

Informationen nach Artikel 13 und 14 Datenschutz-Grundverordnung betreffend die Verarbeitung Ihrer personenbezogenen Daten finden Sie auf unserer Website unter www.bvaeb.at/Datenschutz

Formular drucken | Formular zurücksetzen

AUVA
Allgemeine Unfallversicherungsanstalt

Unfallmeldung für Studierende an Universitäten, Pädagogischen Hochschulen, Fachhochschul-Studiengängen u. Ä. gemäß § 363 Abs. 4 des Allgemeinen Sozialversicherungsgesetzes (ASVG)

WICHTIG: Bei jeder körperlichen Schädigung besteht gesetzliche Meldepflicht innerhalb von fünf Tagen. Unfälle mit Zahnschäden oder Beschädigung von prothetischen Hilfsmitteln sind jedenfalls zu melden.

1. Unfallzeitpunkt (Wochentag, Datum, Uhrzeit)

DATEN DER UNIVERSITÄT/FACHHOCHSCHULE/AKADEMIE/DES INSTITUTES

2. Bezeichnung (Anschrift, PLZ/Ort)
3. Für Rückfragen (Ansprechperson/Tel.)

DATEN DES/DER VERUNFALLTEN STUDIERENDEN

4. FAMILIEN-/NACHNAME
Vorname
Wohnanschrift
5. a Vers.-Nr.
5. b Geburtsdatum Tag Monat Jahr
6. Geschlecht ☐ männlich ☐ weiblich
7. Staatsbürgerschaft
8. Studienrichtung
Matrikelnummer
ordentliche/r Hörer/in ☐ ja ☐ nein
9. gesetzliche Krankenversicherung
☐ selbstversichert ☐ als Angehörige/r mitversichert
☐ nicht versichert ☐ konnte nicht erhoben werden
10. (geplante) Anwesenheitszeit des/der Verletzten am Unfalltag Beginn: Ende:
11. Dauer der Lehrveranstaltung, in der der Unfall passierte Beginn: Ende:

ANGABEN ZUM UNFALLGESCHEHEN UND ZU DEN UNFALLFOLGEN

12. Art der Lehrveranstaltung (z. B. Vorlesung, praktische Übung, (Pro-)Seminar, Exkursion u. Ä.)
13. Unfallstelle (bitte genau angeben, z. B. welcher Raum, wenn nicht ident mit der o. a. Anschrift, auch die Adresse)
14. Unfallhergang (bitte unbedingt Tätigkeit, verletzungsbewirkenden Gegenstand/Arbeitsstoff und Unfallursache angeben)
Bericht über das Unfallgeschehen durch ☐ Verletzte/n selbst ☐ Mitstudierende/n ☐ Lehrende/n ☐ andere Person
15. Bei Wegunfällen
Ausgangsort:
Zielort:
Zweck des Weges:
16. Bitte um Angabe bei Verkehrsunfällen: Wie bzw. womit war der/die Verletzte unterwegs?
☐ Fußgänger/in ☐ Fahrrad
☐ PKW ☐ Skateboard
☐ öffentl. Verkehrsmittel ☐ Inline-Skates
☐ Moped/Motorrad ☐ anderes
17. Rettungseinsatz? ☐ ja ☐ nein ☐ nicht bekannt
18. Unfall mit tödlichem Ausgang? ☐ ja ☐ nein
19. Erhebung durch Polizei ☐ ja, Dienststelle: ☐ nein ☐ nicht bekannt
20. Verletzter Körperteil (Körperseite?)
21. Verletzungsart
22. Behandlung im Krankenhaus ☐ ja ☐ nein
Wann und welches? ☐ ambulant ☐ stationär
23. Ärztl. Behandlung außerhalb eines Krankenhauses ☐ ja (Name, Anschrift u. Datum angeben) ☐ nein
24. Könnten Maßnahmen getroffen werden, um zukünftig solche oder ähnliche Unfälle zu vermeiden?
☐ ja, welche?
☐ nein, warum nicht?
Zur Vorbeugung von Unfällen bietet Ihnen das Expertenteam der AUVA gerne Rat und Hilfe an.
Wenden Sie sich bitte mit Ihren Fragen und Wünschen an die für Ihren Bereich zuständige Landesstelle!
25. Ort, Datum der Ausfertigung
Dienstsiegel der Einrichtung
Unterschrift
(Leiter/in/Leiter der Einrichtung)

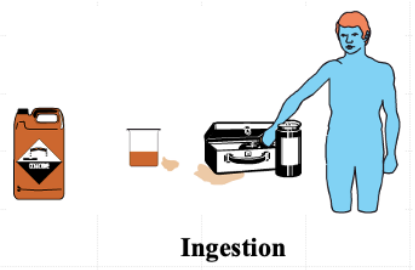
ZVA-003ST-09/2014e

DVR: 0024163

Wegunfälle zu oder von einer Lehrveranstaltung sind durch jene Stelle zu melden, der die Lehrveranstaltung zugeordnet ist – sonstige Wegunfälle durch jene Stelle, an der der/die Studierende im Semester des Unfalles vorwiegend studiert.

https://ucloud.univie.ac.at/index.php/s/rTePHeHcFzPao6s?path=%2FUnfallmeldung_accident%20report

Ways of exposure and what to do



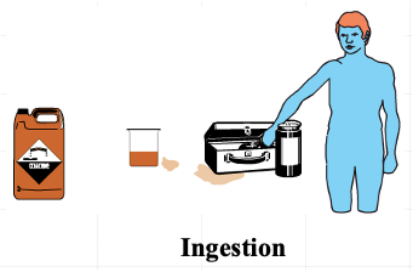
- 4 main ways:
  - ❖ Ingestion:
    - ➢ Occurs by absorption of chemicals through the digestive tract.
    - ➢ Can occur directly and indirectly.
      - o Direct ingestion can occur by accidently eating or drinking a chemical
      - o Indirect ingestion can occur:
        - ✓ When food or drink is brought into a laboratory
        - ✓ When food or drink is stored with chemicals, such as in a refrigerator
        - ✓ When someone who handles chemicals does not wear gloves or wash the hands frequently

Ways of exposure and what to do

- 4 main ways:
  - ❖ Ingestion:
    - ➢ Symptoms:
      - o Metallic or other strange tastes in the mouth
      - o Stomach discomfort
      - o Vomiting
      - o Problems swallowing
      - o General ill feeling
    - ➢ What to do?
      - o If you think you may have accidentally ingested a chemical, seek medical attention immediately and/or call the Poison Information Center.

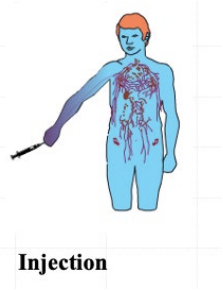
Ways of exposure and what to do

- 4 main ways:
  - ❖ Ingestion:
    - ➢ How to prevent?
      - Properly labelling all chemical containers
      - Never consuming food or drink or chew gum in laboratories
      - Always wearing PPE (gloves)
      - Practicing good personal hygiene (frequent hand washing)



Ways of exposure and what to do

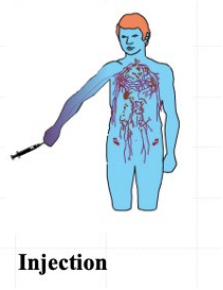
- 4 main ways:



  - Injection:
    - Can occur when handling chemically contaminated items (broken glass or plastic, pipettes, needles…) capable of causing punctures, cuts, or abrasions to the skin.
    - When this occurs, chemicals can be injected directly into the bloodstream and cause damage to tissue and organs.
    - Due to direct injection into the bloodstream, symptoms may occur immediately.

Ways of exposure and what to do

- 4 main ways:

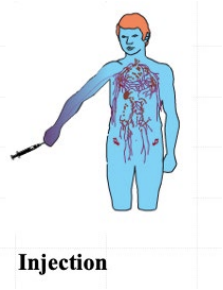

Injection

  - ❖ Injection:
    - ➢ What to do?
      - o If you do receive a cut or injection from a chemically contaminated item, try to remove it and immediately rinse under cold water.

      - o Administer first aid and seek medical attention if necessary and then complete an accident report.

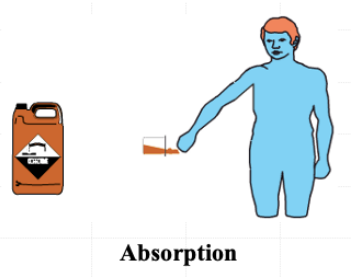
Ways of exposure and what to do

- 4 main ways:


Injection

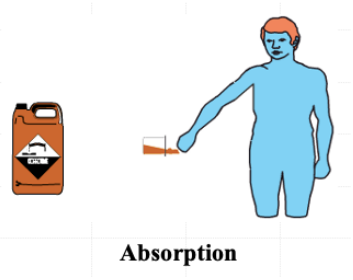
  - ❖ Injection:
    - ➢ How to prevent?
      - o Wearing proper PPE.
      - o Inspecting all glassware before use and immediately disposing it if it is damaged.
      - o Whenever cleaning up broken glass or other sharp items, always use a broom, scoop or dustpan, or devices such as pliers.
      - o If you must use your hands, wear leather gloves when handling broken glass.

Ways of exposure and what to do



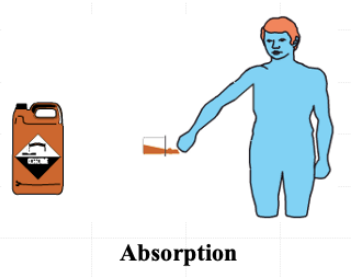
- 4 main ways:
  - ❖ Absorption:
    - ➢ Some chemicals can be absorbed by the eyes and skin, resulting in a chemical exposure.
    - ➢ Exposure results from a chemical spill or splash to unprotected eyes or skin.
    - ➢ Once absorbed, the chemical can quickly go into the bloodstream and cause further damage, in addition to the immediate effects that can occur to the eyes and the skin.

Ways of exposure and what to do



- 4 main ways:
  - ❖ Eye absorption:
    - ➢ Symptoms:
      - o Burning sensation
      - o Blurred vision
      - o Discomfort
      - o Blindness
    - ➢ What to do?
      - o If you do get chemicals in your eyes, immediately go to an eyewash station and flush your eyes for at least 15 minutes.
      - o Seek medical attention immediately and complete an accident report.

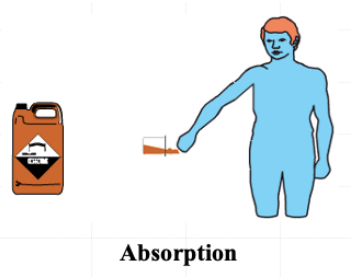
Ways of exposure and what to do



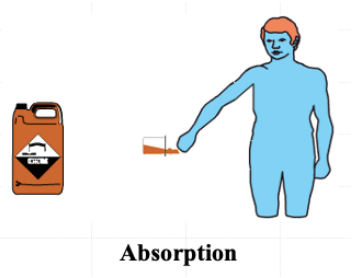
- 4 main ways:
  - ❖ Eye absorption:
    - ➢ How to prevent?
      - o Always wear safety glasses in the laboratory.
      - o Whenever a severe splash hazard may exist, use a face shield, in combination with splash goggles.

Ways of exposure and what to do

- 4 main ways:
  - ❖ Skin absorption:
    - ➢ Symptoms:
      - o Dry, whitened skin
      - o Redness
      - o Swelling
      - o Rashes
      - o Blisters, itching, chemical burns, cuts, and defatting

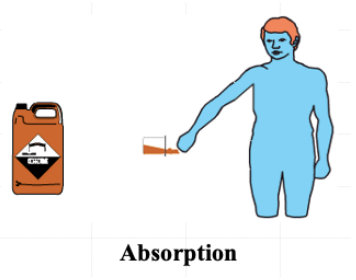


Ways of exposure and what to do



- 4 main ways:
  - ❖ Skin absorption:
    - ➢ What to do?
      - o For small chemical splashes, remove any contaminated gloves, lab coats… and wash the affected area with soap and water for at least 15 minutes.
      - o Seek medical attention afterward, especially if symptoms persist.
      - o For large chemical splashes, it is important to get to an emergency shower and start flushing for at least 15 minutes.
      - o Once under the shower, remove any contaminated clothing.
      - o Seek medical attention immediately and complete an accident report.

Ways of exposure and what to do



- 4 main ways:
  - ❖ Skin absorption:
    - ➢ How to prevent?
      - o Wear the proper gloves, wear a lab coat and other personal protective equipment required (such as protective sleeves, face shields…).
      - o Don’t wear shorts and sandals in the lab.

How to work with gases

Gas Cylinders

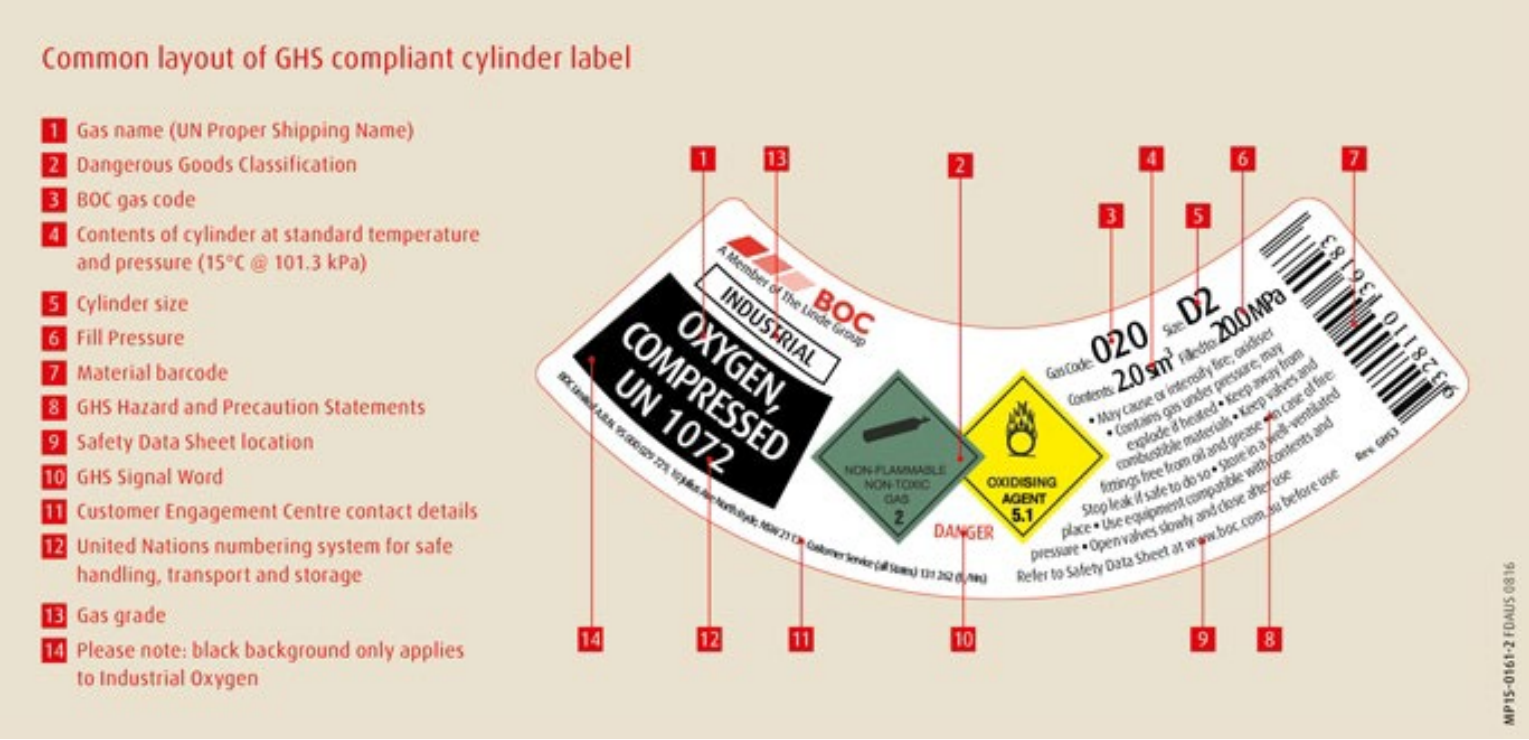
Color code for the gases contained

Cylinder colours	Shoulder colours	Gas	Shoulder colours	Gas
 Silver grey	 White	Oxygen	 Brown	Helium
	 Black	Nitrogen	 Yellow	Toxic and/or corrosive gases
	 Bright green	Other inert gases	 Red	Flammable gases
	 Grey	Carbon dioxide	 Maroon	Acetylene
	 Dark green	Argon		

How to work with gases

Gas Cylinders

Information in the label



How to work with gases

Gas Cylinders

How to handle them safely?

- Inspect all cylinders and valves for damage.
- Never open a damaged valve.
- Use the appropriate regulator (check pressure and content).
- Secure cylinders to a wall.
- Close all valves when cylinders are not in use.
- Do not drop or bang cylinders against each other.

How to work with gases

Gas Cylinders

How to handle them safely?

- Move cylinders using a hand truck.
- Do not enter in an elevator with a cylinder.
- Do not apply any lubricant or tape to cylinder valves.
- Keep dirt, rust, oil or grease away from all cylinders or fittings.
- Avoid direct skin contact with gas escaping from a cylinder.

How to work with gases

Gases in general

How to handle them safely?

- Always check the Safety Data Sheet (SDS) and label for information about the hazards.
- If it is not possible to eliminate the use of the hazardous product, try to substituting it with a less hazardous one.
- Work in well-ventilated areas.
- Use the smallest amount possible.
- Always wear appropriate protection.

How to work with liquid N_2 and dry ice

Liquid N_2:

Is nitrogen gas held at an extremely low temperature (around -195 °C) where it becomes a liquid

Risks:

- Frostbite / Cold Burns.
- Asphyxiation.
- System Pressurization.
- Oxygen Condensation.

How to work with liquid N_2 and dry ice

Dry ice:

Dry Ice is a solid form of carbon dioxide (gas) held at around -78.5 °C

Risks:

- Frostbite / Cold Burns.
- Asphyxiation.
- System Pressurization.

How to work with liquid N_2 and dry ice

Liquid N_2 and dry ice:

How to protect yourself:

- Use Personal Protective Equipment (cold protection gloves and regular PPE).
- Use of trolleys and wheeled containers for the safe manipulation of larger dewars.
- Use specially designed vessels for storage.
- When transportation, do not go in the lift together with the dewars.

How to work with liquid N_2 and dry ice

Liquid N_2 and dry ice:

How to protect yourself:

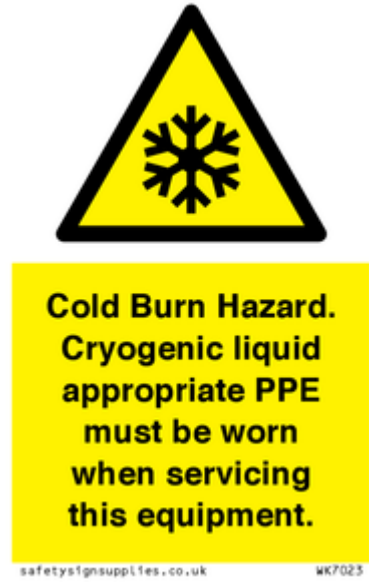
- When disposing them do not pour them down the sink.
- In case of disposing them through vaporization, they must be left in a well ventilated area.
- Use liquid nitrogen only to cool sealed or evacuated systems to prevent oxygen condensation on the inside of cooled vessels.
- Do not allow untrained persons to use them.

How to work with liquid N_2 and dry ice

Liquid N_2 and dry ice:

What to do incase of an accident:

- Cold burn:
  - Remove any restrictive clothing
  - Flush the affected area with tepid water
  - Keep patient warm
  - Obtain medical assistance immediately



How to work with liquid N_2 and dry ice

Liquid N_2 and dry ice:

What to do incase of an accident:

- Anoxia (physiological oxygen depletion) or CO_2 poisoning:
  - ➢ Go/take the person to a well ventilated area
  - ➢ If breathing stops inform the local first aider and give artificial respiration

❑ Do not attempt to rescue anyone from a confined space, open the door and call the emergency number

How to work with liquid N_2 and dry ice

Liquid N_2 and dry ice:

What to do incase of an accident:

- Spillage:
  - ➢ Evacuate the immediate area
  - ➢ Allow the liquid/solid to evaporate ensuring good ventilation
  - ➢ Check the oxygen/CO_2 sensor before re-entering the area

❑ In case of big spillage, inform safety officers

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List of Safety-Related Officers – Institute of Organic Chemistry

	Bonifazi group	Maulide group	Institute – other
Fire wardens (Brandschutzwarte)	Igor Echevarria Poza Edrin Sulejmani	Florian Doubek*)	Christian Dank*) Roman Lichtenecker*) Javier Mateos Katharina Pallitsch
First aiders (Ersthelfer)	Igor Echevarria Poza Edrin Sulejmani	Omar Abdo (UZA II)*) Florian Doubek*)	Monika Hafenscher*) Daniel Kaiser*) Roman Lichtenecker Javier Mateos Katharina Pallitsch
SVP safety representatives (Sicherheitsvertrauenspersonen)	Igor Echevarria Poza	Julia Sauter	
Gift person authorised to purchase toxic substances (Giftempfangsbevollmächtigte)	Igor Echevarria Poza	Julia Sauter	Christian Dank Roman Lichtenecker Javier Mateos Katharina Pallitsch

*) According to u:find - Institut für Organische Chemie, 21.03.2025

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Thank you for your attention!

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Office: 1148